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# Card game restriction in LHC can only be successful!

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## Abstract

We argue that a restriction determined by a drawn card or quantum random numbers, on the running of LHC (Large Hadron Collider), which was proposed in earlier articles by us, can only result in an, at first, apparent success whatever the outcome. This previous work was concerned with looking for backward causation and / or influence from the future, which, in our previous model, was assumed to have the effect of arranging bad luck for large Higgs producing machines, such as LHC and the never finished SSC (Superconducting Super Collider) stopped by Congress because of such bad luck, so as not to allow them to work.

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## 1 Introduction

In the previous articles [1] we proposed that one should use the LHC-machine to look for backward causation effects. Indeed, we proposed a model [1, 2, 3, 4] in which the realized history of the universe was selected so as to minimize a certain functional of the history, a functional being the imaginary part of the action  $S_I$  [history], which only exists in our model. In general, it is assumed in science that there is no pre-arrangement [5] of initial conditions so as to make special events occur or not occur later. However J. Bell proposed BBC as a solution to the problems of Einstein - Podolsky - Rosen's "super-determinism" [6]. Also, one of the present authors (H.B.N.) and his group earlier proposed models nonlocal in time (and space) [7, 8, 9]. Similar backward causation effects have also been proposed in connection with the story that e. g. humanity would cause a new vacuum to appear, "vacuum bomb," by one of the present authors (H.B.N.) and collaborators [10]. Our proposal is to test if there should perhaps be such pre-arrangements in nature, that is, pre-arrangements that prevent Higgs particle producing machines, such as LHC and SSC, from being functional. Our model with an imaginary part of the action [1, 11] begins with a series of not completely convincing, but still suggestive, assumptions that lead to the prediction that large Higgs producing machines should turn out not to work in

that history of the universe, which is actually being realized.

The plan behind the practical experiment, which we proposed, was to produce some random numbers—partly by drawing cards and partly by quantum random number generation – and then let these random numbers be translated, according to the rules of the game, into some restrictions on the luminosity or the energy or both of the LHC. Thus LHC might, for instance, only be allowed to run up to a certain beam energy. I. Stewart [11] proposed that pauses are determined by random numbers.

The idea is merely to require any restriction at all for LHC with probability  $p$  that is deemed, by the rules of the game, to be very small. The probability  $p$  for a “close LHC” card is  $p \sim 10^{-6}$  or so.

It is clear that even a small probability restriction being enforced on LHC, its luminosity or beam energy, means an artificially imposed – one would say, ignoring our type of model, unnecessary – risk for the LHC project.

It is, however, the main focus of the present letter to point out (as was briefly started in the previous article [1]) that even though our proposed project of restricting LHC according to random numbers seems to give rise to a loss, in fact, whatever happens seems – initially at least – to be a gain, a success!

That a success in this sense is guaranteed to be the result seemingly with almost 100% certainty (but in reality not quite 100%) is demonstrated in the present article.

## 2 Card game for LHC restrictions can only be a success!

There are two possibilities.

- 1) You draw a card combination of the most common type leading to no restrictions. Then LHC can run without any restriction and you can be totally happy because you found, with close to zero expense, an argument against our theory. You almost kill our theory, or at least drastically diminish the chance that it is right. This is a very good scenario!
- 2) You draw a restriction card combination. Now, it is a significant loss that LHC cannot run in full, but now you have proved our, or a similar, backward

causation theory. This would be so interesting, if one really had backward causation, that it might be counted as a discovery greater than supersymmetric partners or the finding of the Higgs. It would be a fantastic discovery made with LHC! If the restriction drawn is not a totally closing, you would likely soon also find the Higgs and perhaps the supersymmetric partners even if statistics might initially be a bit worse than hoped for.

It would be a wonderful victory for CERN and LHC to find backward causation together with having to obey the most likely very mild restrictions. We should remember that the rule of our card game should be to make the milder restriction have a much higher chance of being drawn than the very strong restriction of, for example, totally closing LHC.

Quite correctly, there is, though little chance of, a true loss even though it will not be initially noticed. It is possible, although not likely, that a random number game leads to a restriction even if our model, and any model with backward causation, is wrong. In this case, we have a bad bargain: not only would we loose the full applicability of LHC, but we would also have gotten, by a statistical fluctuation, the wrong impression that a backward causation containing model were indeed true without this actually being the case.

We should certainly arrange the restriction probability  $p$  to be low enough to make this bad case have a very low probability.

One would, from this way of arguing, initially suspect that it would be most profitable not to perform our random number LHC restricting experiment because if our theory were right LHC would, in any case, be closed or restricted somehow by prearranged bad luck, as happened to SSC, for which Congress in the U.S.A. terminated economic support. Now, however, we want to argue that it would be more agreeable to have LHC be stopped or restricted by a random number game rather than by some bad luck such as political withdrawal of support. The main reason for the artificially caused random number withdrawal being preferred is that we would, in this case, get more solid support for our, or a similar, model being true than by the same restriction coming about through a bad luck accident.

To see that would be more convincingly shown the truth of our theory of imaginary action determined by history if we have a card or random number closure rather than a “normal” failure, we could contemplate how much more convincing our the-

ory would have been today if the SSC-machine had been closed after a random number experiment rather than mainly for economical reasons or perhaps because of the collapse of the Soviet Union, which made the competition with 60 million dollar accelerators not worthwhile.

Now it is sometimes explained that SSC [12] had bad luck because of various stupidities or accidents, but had it been a card game nobody could come up with such foolish cards. Everything is an accident, but we would know the probabilities very reliably. So if the card game were set up so that the closing probability were sufficiently small, we would have been sure that the closing of SSC were due to a (anti)miracle.

In the following, we shall present a little calculational example to illustrate formally that a more reliable knowledge of the truth of our theory is obtained with a random number experiment. This comes under the discussion of point 2) among the reasons for conducting our proposed experiment later in the present article.

### **3 Reasons for conducting our proposed experiment**

What could be a reason to conduct the card game experiment?

- 1) To obtain greater conviction about the truth of our theory
  - if it is true of course. –
- 2) To perhaps avoid bad backward causation effects.

These are the two benefits you could have.

In formula it would mean that we should estimate averages for the two measures of these two benefits.

#### **3.1-a More conviction of truth of our model**

For reason 1) – the conviction about our theory that it is indeed right – we need some measure. Both the result of the card game and the failure of the LHC for other reasons are statistical events, but, while we have very trustable ideas about what probability  $p$  to assign to a given class of card combinations, our assignment of

a trustable value for the failure probability  $f$  for other reasons is very difficult and has a huge uncertainty. Therefore, if LHC fails for a reason other than a random number game, we would have not even truly learned that our theory was right even though we would say “it is remarkable that the present authors wrote about the failure while LHC still looked to be able to work.”

### 3.1-b Miraculosity and estimating evidence for our model

In order to understand why the difference between getting our model supported by a “natural” failure of LHC and a failure caused merely by having a card game drawing a “restrict LHC” card gives rise to an important difference in trustability in our model. We shall give a slight formal illustration using the statistical model which is not very exact but is appropriate for illustrating our point.

If, in our model, a seemingly other reason failure of LHC occurs merely through the coincidence of a series of small bad luck events – that by themselves can easily happen – then the number and unlikeliness of elements in this series of bad luck events must be proportional to  $-\ln f = |\ln f|$  where  $f$  is the probability of failure. We could call this quantity  $-\ln f$  the “miraculosity” for failure in a seemingly natural way. This concept of “miraculosity” becomes a measure for how many “submiracles” must occur. As examples of submiracles, there are “the watch man having drunk a bit too much”, “the connection between super conducting cables having too high resistance”, “The accident being in the difficult part of the tunnel, just under Jura mountain” etc.

Now if we set up a card or quantum mechanically based random number generator leading to “restrict LHC” with probability  $p$ , it needs to generate – by the selection of the realized history in our model – a number of adjusted accidents (or submiracles) in a number proportional to  $-\ln p = |\ln p|$ . Essentially, in the case of the truth of our theory, whether the failure of the LHC will arise via the card or the quantum random number game or via a natural reason will depend on which of the two alternative miraculocities  $-\ln p$  or  $-\ln f$  is the smallest. There will, of course, be a preference with “miraculosity”: the least miraculous of the two alternative possibilities for failure will most likely be the one that occurs. This would require fewest submiracles.

We can define  $f$  so that indeed  $-\ln f$  gives a measure of the “miraculosity”,

but it is very difficult even for people building the LHC, to convincingly figure out what to accept or predict about this miraculosity  $-\ln f = |\ln f|$ . At best, one can predict it with an appreciable uncertainty. That is to say, we obtain, at least from some simulation – say by Monte Carlo methods or just theoretically – a probability distribution for “miraculosity”  $|\ln f|$ . To illustrate our point of estimating the degree of conviction, which we shall obtain in the case of a “natural” and / or “normal” failure, we can assume that the probability calculation – by (computer) simulation of the political and technical procedures around CERN and LHC – led to a Gaussian distribution for the miraculosity  $-\ln f$ . That is to say, we assume the probability distribution

$$\begin{aligned} P(|\ln f|) d|\ln f| &= \\ &\approx \frac{1}{\sigma\sqrt{2\pi}} \exp\left(\frac{1}{2\sigma^2} (|\ln f| - |\ln f_0|)^2\right) d|\ln f|. \end{aligned} \tag{1}$$

Here,  $\sigma$  is the spread of the distribution for the logarithm of  $f$ , i.e., the “miraculosity.”

Now let us consider the degree of remarkableness for the failure depending on whether it is due to the card or the quantum random number game or a “normal” failure, i.e., other reasons such as meteors and bad electrical connection between the superconductors.

In the case of a card or quantum random number game, the number of sub-miracles in the card or quantum packing is proportional to  $-\ln p$ , where  $p$  is the arranged probability by the game rules.

However, if there is instead a “normal” failure due to the stupidity of some members of cabinet or the like, then we would tend, of course, to believe that the true miraculosity  $-\ln f = |\ln f|$  for that failure is indeed in the low end of the estimated Gaussian distribution. In other words, we would expect that, after all, the “true” probability for failure  $f$  is rather high, i.e.,  $f > f_0$  or presumably even  $f \gg f_0$

Let us indeed evaluate the expected probability for a seemingly “normal” (i.e., not caused by card etc games) failure. This expected normal probability for failure is

$$\langle f \rangle = \int_{-\infty}^{\infty} \frac{1}{\sigma\sqrt{2\pi}} \cdot f \cdot \exp\left(-\frac{1}{2\sigma^2}(\ln f - \ln f_0)^2\right) d|\ln f| \tag{2}$$

(we imagine that the miscalculation by including the  $f > 1$  region is negligible, but one could of course do better if needed).

We immediately write  $f = e^{-|\ln f|}$ . We had hoped to expect “normal” failure with the probability given by

$$\begin{aligned}\langle f \rangle &= \int_{-\infty}^{\infty} \frac{1}{\sigma\sqrt{2\pi}} \cdot \exp\left(-\frac{1}{2\sigma^2}(|\ln f| - |\ln f_0|)^2 - |\ln f|\right) d|\ln f| \\ &= \int_{-\infty}^{\infty} \frac{1}{\sigma\sqrt{2\pi}} \cdot \exp\left(-\frac{1}{2\sigma^2} \left[ (|\ln f| - |\ln f_0| + \sigma^2)^2 \right. \right. \\ &\quad \left. \left. - \sigma^4 + 2\sigma^2|\ln f_0| \right] \right) d|\ln f| \\ &= \exp\left(\frac{\sigma^2}{2} - |\ln f_0|\right) = f_0 e^{\sigma^2/2}.\end{aligned}\tag{3}$$

Hence the remarkable or apparent miraculousness of the outcome that LHC should fail seemingly by a “normal” accident – such as political closure – is not the “miraculosity” corresponding to the most likely value for  $f$ , i.e.,  $-\ln f_0 = |\ln f_0|$ , but rather to “remarkableness”  $= -\ln \langle f \rangle = |\ln \langle f \rangle| = |\ln f_0| - \frac{\sigma^2}{2}$ .

It is this correction by the term  $-\frac{\sigma^2}{2}$  that causes less conviction for our model being true if the failure of LHC shows up as a “normal” failure, than if we get a failure caused by a card or quantum random number game. One should keep in mind that whether in our model one or the other reasons for failure occurs depends largely on the relative sizes of  $-\ln f$  and  $-\ln p$ .

In this way, it would be more convincing that our theory were true if the failure were found by a card game or the like than by a “normal” failure of LHC. It would thus be profitable scientifically if we could provoke a card game failure instead of a “normal” one; we would have the possibility of arranging that if our model were right. In the case of our model being wrong, of course, the card game project would only add to the totally failure probability of LHC, making a card game a risk and a bad thing.

Should our theory be right, the failure of LHC would be guaranteed with  $\frac{2}{3}$  probability, and in that case, the chance of total failure probability would not change greatly whether we perform a card game project or not. In that case we would just move some failure probability from the “normal” failure due to the card game or the similar case.

If we place some economical value on the degree of confidence we would obtain if our model were indeed true depending on whether one failure or another really

occurred, we could put this benefit into the form

$$\begin{aligned} b_{1)} &= c \cdot \text{“remarkableness”} \\ &= c \cdot \begin{cases} |\ln p| & \text{if game failure} \\ |\ln \langle f \rangle| = |\ln f_o| - \frac{\sigma^2}{2} & \text{if “normal” failure.} \end{cases} \end{aligned} \quad (4)$$

In the case of our theory being right, which occurs with probability  $r$ , we estimated that LHC would be stopped with  $\frac{2}{3}$  probability [1] so that this benefit will be calculated as an average,

$$\begin{aligned} \langle b_{1)} \rangle &= c \cdot \text{“remarkableness”} \\ &= c \left\langle \left( \frac{p}{f+p} |\ln p| + \frac{f}{f+p} \left( |\ln f_o| - \frac{\sigma^2}{2} \right) \right) r \frac{2}{3} \right\rangle_{\text{Gauss}}, \end{aligned} \quad (5)$$

where the average  $\langle \cdots \rangle_{\text{Gauss}}$  is merely the average over distribution (1) .

For instance, in the limit of a very small probability  $p$  assigned to the random number restricting LHC, we would get

$$\langle b_{1)} \rangle \approx c \left( |\ln f_o| - \frac{\sigma^2}{2} \right) r \cdot \frac{2}{3} + cp \left\langle \frac{1}{f} \right\rangle \left( |\ln p| - |\ln f_o| + \frac{\sigma^2}{2} \right) r \frac{2}{3} + \dots \quad (6)$$

If, on the other hand, we set  $p \gg \langle f \rangle$ , we would get

$$\langle b_{1)} \rangle \approx \left( |\ln p| + \frac{\langle f \rangle}{p} \left( |\ln f_o| - \frac{\sigma^2}{2} - |\ln p| \right) \right) r \cdot \frac{2}{3}. \quad (7)$$

It is important to notice that, as the previous discussion suggested, the correction term in (6) will, for small enough  $p$ , give increasing benefit with increasing  $p$  so that it would be beneficial *w.r.t.* this benefit  $b_{1)}$  of attaining an increase in the safety of our knowledge that  $p$  is not completely zero in our model.

### 3.2 Avoiding bad backwardly caused events

In our earlier paper, we included, in our estimates of whether it would pay to perform our card game or random number game experiment, the consideration that if we indeed have backward causation for LHC becoming inoperable, then these pre-arrangements could have side effects that might be bad and, *a priori*, perhaps also good. The backward causation effects might end up being huge in much the same way as the famous forward causation effect of the butterfly in the “butterfly effect”,

but in the same way as it is difficult to predict whether the effects are good or bad when the butterfly beats its wings in a particular way, it is hard to know if the pre-arrangements set up to prevent LHC from working are good or bad. If we think of such possibilities as the closure of CERN or an earthquake in Geneva, we may judge it to be bad, but if we think of even earlier or further distant pre-arrangements, it becomes increasingly difficult to estimate either good or bad. For instance, it is a possibility that a major factor behind the SSC being terminated by Congress was the collapse of the Soviet Union [13]. This were a huge backward causation effect but it is hard to evaluate the probability as to whether it is good or bad. Thus, it would have been hard to evaluate, in advance, whether our card game would have been profitable had our theory been known then.

In the previous articles [1], we called the price of the damage arising in excess when a “normal” failure of LHC is provoked,  $d$ .

We should imagine that the very huge backward causation effects occurring very remotely from the LHC are probably averaged out to zero, similar to the far future effects of the butterfly wing. Hence the important contributions to the damage cost  $d$  are rather close in time (and space) to the LHC itself. We very roughly estimated, in our previous study,  $d \approx 10 \cdot \text{“cost of LHC”} \simeq 10 \cdot 3.3 \cdot 10^9 \text{ CHF} = 3.3 \cdot 10^{10} \text{ CHF}$ .

In the case of the card game failure, there may also be huge effects, but now the evaluation of the damage being good or bad would be totally opaque. Only the effects of performing the actual experiment may have any predictable average effect. Therefore, in the case of such an artificial failure, the damage would be limited to statistically washing out damage (i.e., they are equally likely to be good or bad) and the obvious loss because of the restriction on the  $d_{\text{rest.loss}}$  card drawn.

We should arrange the latter damage to almost certainly be the minimal one by assigning mild restrictions to be much more likely outcomes than heavy restrictions.

The damage done, or by switching the sign, the (negative) benefit, is

$$-b_{2j} = d \cdot \frac{2}{3}r \cdot \frac{f}{f+p} + d_{\text{rest.loss}} \cdot \left( p \left( 1 - \frac{2}{3}r \right) + \frac{2}{3}r \cdot \frac{p}{f+p} \right), \quad (8)$$

where we used the notation  $d_{\text{rest.loss}}$  for the cost of the restrictions.

## 4 Conclusion

We have argued that it would be a good idea to perform our earlier proposed experiment of generating some random numbers – by card drawing or by a quantum random number generator, or even both ways – and letting them then be decisive in applying restrictions on the beam energy and/or the luminosity and/or the like.

The main point was that our theory, referred to as “model with an imaginary part of the action”, is indeed right if LHC is stopped by our proposed game than if it just failed for some technical or political reason. The reason for it being more convincing that the stoppage of LHC is due to a random number rather than a “normal” failure is that it is very hard to estimate in advance how likely it is for a “normal” failure of LHC to occur.

The greatest encouragement for performing the experiment without much hesitation is the remark that whatever happens with our proposed experiment, it will, in practice, seem to be a success or at least to be of no harm. The point is that in the case of any restriction being imposed by the random numbers, we have, because of the very fact of these random numbers being generated at all, obtained the shocking great discovery that there is “backward causation.” Such a discovery of the future influencing the present and past would be monumental. Consequently, we would be very happy and it would be a fantastic success for the LHC to have caused such a discovery!

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